

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (original): An apparatus measuring the parameters in a volume with  $V=V(t)$ , where  $t$  is time; the apparatus comprising:

two signal sources  $A=A(t)$ ,  $B=B(t)$  with  $A(t)=B(t)K_0$ , where  $K_0>1$ ,  $V(t)=B(t)K_1$ , where  $K_0$ ,  $K_1$  are stationary in a time interval  $t_0$ , where  $t_0$  is any real value; and

detectors to measure the  $B'(t)=B(t)+N_B(t)$  and the one assigned as  $C'(t)=C(t)+N_A(t)$ , where  $C'(t)$  can be either  $V'(t)=V(t)+N_V(t)$  or  $A'(t)=A(t)+N_A(t)$ ,  $N_B(t)$  is the noise of  $B(t)$ ,  $N_A(t)$  is the noise of  $A(t)$ , and  $N_V(t)$  is the noise of  $V(t)$  during the measurement time interval  $t_0$ ,

wherein the measured signals  $B'(t)$  and  $C'(t)$  are transferred into electro optical signals and sent into a data processor to analyze either  $K_0$  or  $K_1$ .

Claim 2 (original): An apparatus as claimed in Claim 1 wherein  $V=V(t)$  comprises:

an additional property of  $V(t)=K_2P(t)$ , where  $P(t)$  is the pressure in  $V(t)$ ,  $K_2$  is stationary in the time interval  $t_0$ , and  $t_0$  is any real number; and

detectors to measure  $P'(t)=P(t)+N_p(t)$ , wherein  $N_p(t)$  is the noise of  $P(t)$  during the measurement time interval  $t_0$ , to transfer the measured  $B'(t)$  and  $P'(t)$  into electro-optical signal and send the signal into a data processor to analyze  $K_2$ .

Claim 3 (original): An apparatus as claimed in Claim 2, wherein the concentration of B is calculated from  $K_2$ .

Claim 4 (original): An apparatus as claimed in Claim 2, wherein the elasticity of  $V(t)$  is calculated from  $K_2$ .

Claim 5 (original): An apparatus as claimed in Claim 2, wherein the  $t_m$  is found at which  $V(t_m)=V$  at maximum volume from  $A(t)$  or  $P(t)$ .

Claim 6 (original): An apparatus as claimed in Claim 5, wherein the  $V(t_m)$  is guiding the injection of an ingredient into V at  $t_m$ .

Claim 7 (original): An apparatus as claimed in Claim 1, wherein  $K_0$  or  $K_1$  is used to analyze the concentration of B.

Claim 8 (original): An apparatus as claimed in Claim 2, wherein  $K_2$  is used to analyze the concentration of B.

Claim 9 (currently amended): An apparatus as claimed in Claim 1 or 2, wherein one of the  $P'(t)$  or  $C'(t)$  is assigned as  $E'(t)$ , said data processor analyze the original data  $B'(t)$  and  $E'(t)$  by the following steps:

- performing a mathematical transformation T on both  $E'(t)$  and  $B'(t)$ ;
- estimating  $K_R$  from the following relation:  $F_i[E'(t)]/F_i[B'(t)] \approx K_R$ ,  $R:0$ , or 1, or 2

accordingly where  $F_i$  is the  $i^{\text{th}}$  order component of the transformation T;

- determining the ratio of two signals  $E(t)$  and  $B(t)$  from the estimated  $K_R$ .

Claim 10 (original): An apparatus as claimed in Claim 9, wherein the mathematical transformation T is linear, said processor further performing the steps of:

- identifying and estimating  $F_i[N_B(t)]$  by the noise around  $F_i[E(t)]$ ; and

determining the estimated  $K_R$  from the following relation:

$$\{F_i[E'(t)]-F_i[N_B(t)]\}/\{F_i[B'(t)]-F_i[N_B(t)]\} \approx K_R.$$

Claim 11 (original): An apparatus as claimed in Claim 9, the processor further performing the step of:

approximation  $K_R$  from the largest value of  $F_i[E'(t)]-F_i[N_B(t)]$  for all kinds of linear transformation T and all possible orders of the transformation T, based on the following relation:

$$\{F_i[E'(t)]-F_i[N_B(t)]\}/\{F_i[B'(t)]-F_i[N_B(t)]\} \leq K_R.$$

Claim 12 (original): An apparatus as claimed in Claim 9, wherein

$E'(t)$  is statistically confident to be not noisy such that  $N_E(t) \approx 0$ ,

$E'(t) = E(t) + N_E(t) \approx E(t)$ ,

$B'(t) = B(t) + N_B(t)$ , and

$E(t) = K_R * B(t)$ ,

said method comprising the steps of:

performing a mathematical transformation T on both  $E'(t)$  and  $B'(t)$ ;

estimating  $K_R$  from the following relation:

$$F_i[E'(t)]/F_i[B'(t)] \approx K_R$$

where  $F_i$  is the  $i^{\text{th}}$  order component of the transformation T and the position of  $F_i[B'(t)]$  is identified by the noise around  $F_i[E'(t)]$ ; and

determining the ratio of two signals  $E(t)$  and  $B(t)$  from the estimated  $K_R$ .

Claim 13 (original): An apparatus as claimed in Claim 12, wherein the mathematical transformation T is linear, further comprising the steps of:

identifying and estimating  $F_i[N_B(t)]$  by the noise around  $F_i[E(t)]$ , and denoting the estimating of  $F_i[N_B(t)]$  to be  $F_i[N_E(t)]$ ; and

estimating  $K_R$  from the following relation:

$$F_i[E(t)]/\{F_i[B'(t)]-F_i[N(t)]\} \approx K_R.$$

Claim 14 (original): An apparatus as claimed in Claim 13, further comprising the steps of:  
approximation  $K_R$  from the largest value of  $F_i[E'(t)]-F_i[NB(t)]$  for all kinds of linear transformation T and all possible orders i of the transformation T, based on the following relation:

$$F_i[E(t)]/\{F_i[B'(t)]-F_i[N(t)]\} \leq K_R.$$

Claim 15 (currently amended): An apparatus as claimed in Claim ~~10 or 13~~ 9, wherein the transformation T is Fourier transform.

Claim 16 (original): An apparatus as claimed in Claim 15, wherein the  $F_i$  is  $F_1$ , the first harmonic of the Fourier transform.

Claim 17 (original): An apparatus as claimed in Claim 9, wherein the step for determining a ratio of two signals E(t) and B(t) based on two real signals E'(t) and B''(t) including noise  $N_E(t)$  and  $N_B(t)$ , respectively, wherein:

E'(t) is a least noisy signal;

$$E'(t)=E(t)+N_E(t),$$

$$B'(t)=B(t)+N_B(t), \text{ and}$$

$$E(t)=K_R * B(t),$$

comprising the steps of:

identifying the minimum of B(t),  $B'(t)_{\min}$ , by E'(t); and

removing the static noise by  $[B'(t)-B'(t)_{\min}]$ .

Claim 18 (original): An apparatus as claimed in Claim 17, further comprising the steps of approximating  $K_R$  by using the following relation:

$$\text{Maximum of } [E(t)-E(t)_{\min}]/\text{Maximum of } [B(t)-B(t)_{\min}] \approx K_R,$$

where  $E(t)_{\min}$  and  $B(t)_{\min}$  are the minimum of E(t) and B(t), respectively.

Claim 19 (original): An apparatus as claimed in Claim 17, further comprising the steps of approximating  $K_R$  by using the following relation:

$$F_i[E(t)-E(t)_{\min}]/F_i[B'(t)-B(t)_{\min}]/ \approx K_R,$$

where both  $E(t)$  and  $B(t)$  are periodic and  $E(t)_{\min}$  and  $B(t)_{\min}$  are the minimum of  $E(t)$  and  $B(t)$ , and  $F_i$  is the  $i^{\text{st}}$  order of a transformation.

Claim 20 (original): An apparatus as claimed in Claim 2, wherein the volume change in a periodic way.

Claim 21 (original): An apparatus as claimed in Claim 1, wherein the signal comprises induced signal.

Claim 22 (original): An apparatus as claimed in Claim 21, wherein the signal comprises and electromagnetic wave.

Claim 23 (original): An apparatus as claimed in Claim 21, wherein the induced signal comprises mechanical wave.

Claim 24 (original): An apparatus as claimed in Claim 1, wherein a signal source in the volume comprises a marker.

Claim 25 (original): An apparatus as claimed in Claim 1, wherein the volume comprises blood.

Claim 26 (original): An apparatus as claimed in Claim 1, wherein the volume comprises tissue.

Claim 27 (original): An apparatus as claimed in Claim 1, wherein a signal source comprises hemoglobin.

Claim 28 (original): An apparatus as claimed in Claim 1, wherein a signal source comprises uric acid.

Claim 29 (original): An apparatus as claimed in Claim 2 further comprises a pressure source for generating the volume change.

Claim 30 (original): An apparatus as claimed in Claim 1, wherein volume change in a periodic way.

Claim 31 (original): An apparatus as claimed in Claim 9, wherein the volume comprises blood, the blood pressure is measured by signal  $E'(t)$ .

Claim 32 (original): An apparatus as claimed in Claim 31, further comprising a instrument for measuring the blood flow  $F'(t)$  in the volume, and means for determining  $K_p$ , which is an indicator of perfusion efficiency, based on the following relation:  $F(t) = K_p E(t)$ .

Claim 33 (original): An apparatus as claimed in Claim 6, further comprising an ingredient detector for injecting another ingredient in accordance with the result of the detector.

Claim 34 (original): An apparatus as claimed in Claim 33, wherein said ingredient comprises glucose and said another ingredient comprises insulin.

Claim 35 (original): An apparatus as claimed in Claim 1, wherein signal is transmitted through communication.

Claim 36 (original): An apparatus as claimed in Claim 1, wherein the volume is in a man-made system.

Claim 37 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises DNA.

Claim 38 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises RNA.

Claim 39 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises protein.

Claim 40 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises colored molecular.

Claim 41 (original): An apparatus as claimed in Claim 4, wherein the  $V$  is a pixie of  $V(x,y,z)$ , a much larger volume.

Claim 42 (original): An apparatus as claimed in Claim 41, wherein the  $V(x,y,z)$  is compared with  $V(x+\Delta x, y+\Delta y, z+\Delta z)$  in which  $\Delta x$ ,  $\Delta y$ ,  $\Delta z$  are the size of the pixie.

Claim 43 (original): An apparatus as claimed in Claim 41, wherein the  $V(x,y,z)$  is compared with  $V_s(x,y,z)$  a stored value in the processor.

Claim 44 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises glucose.

Claim 45 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises cholesterol.

Claim 46 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises triglycerol.

Claim 47 (original): An apparatus as claimed in Claim 1, wherein the signal source comprises  
enamation.